IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

GREEN et al. Atty. Ref.: 850-16

Serial No. 09/664,443 Group: 2682

Filed: 18 September 2000 Examiner: Vo, N.

For: SATELLITE BROADCAST RECEIVING AND DISTRIBUTION SYSTEM

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Assistant Commissioner for Patents
Washington, DC 20231

Sir:

EXPERT DECLARATION OF RANDY BELL

1. I have been retained by Nixon & Vanderhye PC to give an expert opinion in connection with the patent matter identified above. Specifically, I have been asked to give an opinion as to whether the patent specification (including the drawings) attached as Exhibit B (which I understand was filed on April 9, 1997) would have conveyed, as a whole at the time it was filed, with reasonable clarity to someone ordinarily skilled in the art, that the exemplary converters disclosed in the "Description of the Preferred Embodiments" section of that document are block converters that convert blocks of multiple received satellite channels.

2. Although I would have worded the Exhibit B specification differently had I written it myself, it is my opinion that this specification does provide adequate such

description and would have conveyed, to an artisan ordinarily skilled in the art, that the disclosed exemplary converters are each block converters that convert blocks of multiple channels received from a satellite.

3. Figure 2 of Exhibit B shows an item 24 that is described in the "Description of the Preferred Embodiments" section on page 13 of the specification as "a low-noise block converter (LNB)". Low noise block converters were well-known in the 1997 time frame in connection with satellite receiving and distribution systems as devices that process and output blocks of multiple received satellite channels.

4. Figure 2 of Exhibit B shows low-noise block converter 24 as outputting to converters 28 and 30 over lines 26a and 26b, respectively. See Figure 2 and page 14, lines 7-15 of the "Description of the Preferred Embodiments" section. It is therefore clear that disclosed exemplary converters 28 and 30 each receive a block of multiple received satellite channels from the low-noise block converter 24.

5. Although the Exhibit B specification does not use the specific wording "block converter" or "channel block" in connection with exemplary converters 28 and 30, the "Description of The Preferred Embodiments" section of the Exhibit B specification describes these converters as operating to "convert the signals of one polarity up (via converter 30) and to convert the signals of second polarization down (via converter 28)." See page 14, lines 1-4. In this context, the "signals" being referred to are the blocks of multiple channels outputted by the low-noise block converter 24 to the converters 28, 30. Furthermore, the "Description of the Preferred Embodiments" section does not say that converters 28, 30 select particular channels from the low-noise block converter output for

application to cable 16a, and Figure 3a (a schematic diagram of the exemplary downconverter) does not show any bandpass filter of the type that would be required to select a particular channel. Note also that the Exhibit B specification discloses a further embodiment in Figure 5 wherein the low-noise block converter 24 places a block of received channels onto the cable 16a via an amplifier 32a without any further conversion or channelization. See page 27, lines 5-9. For these various reasons, it would have been clear to someone of ordinary skill in the art from reading the Exhibit B specification as a whole that disclosed exemplary converters (e.g., 28, 30, 32a, 36) are block converters that convert blocks of multiple received channels for application to cable 16a.

6. It would also have been apparent to someone skilled in the art that disclosed exemplary "head-out" converters 52, 54, 58 shown in Figure 2 are block converters that convert blocks of multiple received channels the cable 16a is carrying. Once again, although the Exhibit B specification does not use the specific wording "block converter" or "channel block" in connection with exemplary converters 52, 54, 58, the "Description of The Preferred Embodiments" section of Exhibit B states that exemplary converters 52, 54, 58 essentially reverse the process of the head-in processor so that the "reconverted signals, frequencies and polarities in its original state, is transmitted to the satellite receiver 21 via lines 22a and 22b." See page 17, lines 6-9 See also page 17, lines 17-21 ("From the head-out processor, the signals are re-converted to their original state, which was received via lines 26a and 26b. For example, with satellite systems, frequencies typically range between 950 MHz - 1450 MHz ....") Since exemplary converters 52, 54, 58 are performing a "reconversion" to the one performed by exemplary "head-in"

processor converters 28 & 30, the skilled artisan would have understood that the "head-out" converters 52, 54, 58 are also block converters.

7. It would also have been readily apparent to someone skilled in the art reading Exhibit B that exemplary converters 52, 54, 58 output blocks of multiple channels to the disclosed satellite receiver 21. Someone skilled in the art would understand the disclosed "satellite receiver" 21 as a commonly used conventional satellite television receiver that "channelizes" the frequency block output of a satellite dish and selects particular channels to apply to a television set or the like. See also for example page 19, lines 23-25 ("In the embodiments shown above, the satellite receiver 21 and source 20 are conventional components and as such, their schematics are not shown in further detail.") For at least this additional reason, Exhibit B as a whole would have conveyed with reasonable clarity to someone skilled in the art that the various exemplary disclosed converters convert blocks of multiple channels received from a satellite.

8. I have sufficient experience and knowledge to render the expert opinion contained in this declaration. I have worked as an RF design engineer for nearly 25 years, and since 1977 have worked on numerous RF systems including microwave, satellite-based and satellite television systems. I am therefore familiar with the level of ordinary skill with respect to the art(s) of satellite television reception and distribution and related arts in the early 1997 time frame. I earned Bachelors and Master Degrees in Electrical Engineer from the University of Florida in the mid and late 1970's. After graduating from college, I worked as an RF design engineer for various companies from 1977 - 1985 where I designed various types of radio equipment including satellite

receivers and cable television distribution equipment. From 1985 to the present, through my consulting company called Gigacom, Inc., I have worked as a consulting engineer designing microwave, communications, radar, and other equipment for a number of different companies and through my work have come in contact with numerous people skilled in the art. See my attached resume for more details concerning my experience and credentials.

8. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated June 26, 2001

Randy Bell

Randy Bell
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Randy Bell

EXPERIENCE

Gigacom, Inc/Bell Engineering, Fort Walton Beach, FL (1985 - Present) - Designed commercial and military RF/Microwave products for various clients. These include:

Wave Wireless Networking - Designed a 2.4/5.7 GHz translator for use in point to point wireless computer networking.

Rostra Precision Controls - Designed a low cost UHF remote control transmitter that met European emission standards and a 10 GHz automotive backup sensor radar.

Eglin Air Force Base - Designed a low cost miniaturized 1/2 watt 2.2 - 2.3 GHz synthesized missile telemetry transmitter that met IRIG 106 standards.

Wayne Dalton Corp. - Designed a low cost garage door remote control receiver and transmitter.

Baron Services, Inc. - Performed system integration and FCC type acceptance testing of a C and X band 330 and 250 KW pulsed doppler weather radar.

Precision Control Design, Inc. - Designed a low cost low power VHF biomedical telemetry receiver.

PCOM - Designed 5.7 - 5.9 GHz transceiver for use in ISM band. Transmitter had output power of 1 watt and receiver noise figure was less than 1 dB.

SmartSAT Engineering - Designed tri-band up/down converters covering the C, X and Ku communication bands and the Sampling Phase Detector section of a high performance 4 - 8 GHz Frequency Synthesizer.

Metric Systems Corp. - Designed various airborne military data links. This included a 1.8 GHz coherent transponder, 10 GHz receiver, 1.4 GHz MSK transceiver. Circuits designed included: 30 watt 1800 MHz, 30 watt UHF power amplifier, various frequency synthesizers, MSK modulator, FSK/PM modulator, PLL demodulator, GaAs FET low noise amplifier, PIN diode switch, high power limiter and an X-band detector. All circuits were designed to operate over the -54° to +75°C temperature range and met airborne shock and vibration requirements.

Ian - Conrad Bergan, Inc. - Performed study to determined feasibility of building 10 GHz FM-CW radar. Built prototype 10 GHz FM-CW radar and developed a technique for compensation of nonlinear VCO tuning characteristics.

International Systems and Software, Inc. - Designed a low cost synthesized PSK receiver for use in the reception of High Resolution Picture Transmission data from the TIROS-N series of meteorological satellites. This receiver was designed to acquire, track and demodulate a high data rate signal with a large Doppler shift.

StarTech Innovations, Inc. - Designed the transmitter section of a VHF (138-250 MHz) wireless microphone system. This design meet both FCC and European telecommunication standards.

MicroSystems, Inc. - Designed a Drone Target and Control System transponder. This system operated from 5.4 - 5.9 GHz with a power output of 15 watts. Microwave/RF circuits designed included an LNA, mixer, power amplifier, dielectric resonator oscillator, PIN diode antenna switch and pulse modulator, AGC attenuator, log IF amplifier, and tunable band pass filter.

Vitro Services, Fort Walton Beach, FL (1984 -1985) - Designed RF circuitry of an IF monopulse radar processor..

General Electric, Lynchburg, VA (1983 - 1984) - Redesigned the receiver and exciter section of an existing cellular radio base station to operate in the GE proposed Personal Radio Communications Service Band (900- 950 MHz).

Gardiner Communications, Garland, TX (1982 - 1983) - Responsible for the design of components in a 3.7-4.2 GHz satellite receiver and a CATV RF modulator (54-300 MHz). Circuits designed include a synthesized local oscillator (600-900 MHz), microstrip bandpass filters, power divider and directional coupler, a subharmonic mixer and numerous LC type VHF and UHF filters.

GTE Corp., Huntsville, AL (1982) - Designed a low cost 49 MHz FM transmitter for use in a cordless telephone.

RCA, Meadowlands, PA (1981) - Designed a VHF temperature compensated crystal oscillator and circuitry for phase locking the visual and aural exciters of a VHF television transmitter.

Sperry Univac Inc., Salt Lake City, UT (1980 - 1981) - Designed RF and microwave components for a Spread Spectrum data link. Assignments included the design of a wideband UHF power amplifier, VHF IF amplifier strip with AGC , X and Ku band GaAs FET amplifiers, several X band filters and a multi-channel S band modulator. Extensive use was made of the Compact CAD program for circuit design and optimization.

Metric Systems Corp., Fort Walton Beach, FL (1978 - 1980) - Designed analog and digital circuits and did systems analysis on a multi-beam high power search radar, AN/MPS-T9.

Motorola Inc., Fort Lauderdale, FL (1977 - 1978) - Responsible for the design of a low power VHF mixer/oscillator for a Paging Receiver and system test comparing the intermodulation distortion and paging sensitivity of old and new receivers.

Education

University of California, Los Angeles, CA (May 1981) - Attended short course: Microwave Circuit Design.

University of Florida, Gainesville, FL (1976 -1977) - Received Master of Engineering Degree in Electrical Engineering. Main areas of interest: Communications Theory, Digital Signal Processing and Applied Electronics. Grade point average: 3.92/4.0.

University of Florida, Gainesville, FL, (1974 - 1975) - Received Bachelor of Science Degree in Electrical Engineering. Graduated with honors with a grade point average of 3.49/4.0. Member Tau Beta Pi, Eta Kappa Nu and Phi Kappa Phi.

Pensacola Junior College, Pensacola, FL (1971 - 1973) - Received Associate of Science Degree in Electrical Engineering Technology.

Gigacom, Inc. Facilities

Gigacom,Inc. maintains a complete electronics development laboratory with test and measurement capabilities extending from DC to 22 GHz.

RF/MICROWAVE TEST EQUIPMENT
Tektronix Model 2247A Oscilloscope
TBE Electronics Model 214 LC Meter
Marconi Model 2031 Signal Generator
Marconi Model 6960A RF Power Meter
Eaton Model 2075/205 Noise Figure Meter
Hewlett-Packard Model 3478A Multimeter
Wiltron Model 6409 Scalar Network Analyzer
EIP Model 545 Microwave Frequency Counter
Hewlett-Packard Model 8112A Pulse Generator
Hewlett-Packard Model 3577A Network Analyzer
Hewlett-Packard Model 8505A Network Analyzer
Hewlett-Packard Model 5335A Universal Counter
Giga-tronics Model 600 Microwave Signal Generator
Hewlett-Packard Model 8340A Synthesized Sweeper
Farnell Model AMM2000 Automatic Modulation Meter
Hewlett-Packard Model 70300A/70301A Tracking Generator
Hewlett-Packard Model 71210C Microwave Spectrum Analyzer
Hewlett-Packard Model 3780A Pattern Generator/Error Detector
Wandel and Goltermann Model TSA-1 Spectrum/Network Analyzer
Stanford Research Systems Model DS345 Synthesized Function Generator

CAD/CAE SOFTWARE
Tesla - System Simulator
Vellum - Mechanical Design
SysCalc - RF System Analysis
Coda - Crystal Oscillator Design
CiAO - Matching Network Design
WaveCon - Microwave Filter Design
TxRx Designer - RF System Analysis
Spectra Plus - Audio Spectrum Analysis
Protel - Schematic and Printed Circuit Board Design
Acolade - Communications Link Analysis and Design
Touchstone - Linear RF/microwave Circuit Analysis and Optimization
Microwave Office - Linear/Nonlinear RF/Microwave Circuit Analysis and Optimization

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SUMMARY OF EXPERIENCE AND CAPABILITIES

Telemetry Transmitters
RF and Microwave Design
Military/Commercial Data Links
Simulation and Analysis
VCO and Synthesizer Design
Low Power Radar
Microcontroller Design
Transmitter Design and Development
Receiver Design and Development
Fully Equipped Microwave Laboratory
Environmental Testing
Printed Circuit Board Design
Commercial/Mil Spec Manufacturing

Experience and Capabilities

Circuit Design and Development

Telemetry Transmitters
Model GT-100, Synthesized 2.2 – 2.3 GHz, ½ watt power output, 1 MBPS data rate, isolator protected, 2.7 cubic inch volume.
Model GT-200, Synthesized 2.2 – 2.3 GHz, ½ watt power output, 2 MBPS data rate, internal premodulation filter, isolator protected, 1.5 cu. inch volume.

Data Links
RISPO Data Link, 1350 – 1450 MHz, MSK Modulation
P4B ACMI Data Link, 1800 MHz, with coherent phase modulated ranging tones and FSK data modulation
C Band Drone Target and Control System transponder

Radar
10 GHz Diplexed DopplerAutomotive backup collision avoidance sensor.
10 GHz FM/CW Fluid level sensor.
High Power X and C band Pulsed Doppler Weather radar transmitter.
AN/MPS-T9 Search radar

Receivers
Body core temperature data receiver
Tiros-n satellite data receiver
Garage door receivers
VHF paging receiver
Sparrow missile radar receiver

Power Amplifiers
1800 MHz, 30 watt class C
225-400 MHz 20 watt, Class A
5.7 – 5.9 GHz 1 and 2 watts, class A

Components
Filters
Low noise amplifiers
Voltage controlled oscillators
Transmit/Receive switches
Limiters
Sampling Phase Detectors
Pin diode switches
Dielectric Resonator Oscillators

Up/down Converters
X, C and Ku band up/down converter
2.4 /5.7 GHz High power WLAN translator

Frequency Synthesizers
Various synthesizers operating from 100 MHz to 4 GHz

Fully Equipped Laboratory
Test equipment covering DC – 26 GHz
Vector and Scaler Network Analyzer
Spectrum Analysis

Simulation and Analysis Capabilities
Applied Wave Research Microwave Office 2001
Mathamatica
TESLA (system simulation)
Autocad 2000

Engineering Services
Printed circuit design using Protel 99SE and PCAD 2000

Manufacturing
Manufacturing to military or commercial specifications available through local contract manufactures.

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08/838,077

TITLE OF THE INVENTION

Satellite Broadcast Receiving and Distribution System

This is a Continuation-In-Part of Application No. 08/394,234, filed 1-1-95, abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a satellite broadcasting receiving and distribution system and more particularly to a broadcasting receiving and distribution system that will allow for the transmission of vertical and horizontal or left-hand circular and right-hand circular polarization signals to be transmitted simultaneously via a single coaxial cable.

2. Description of the Prior Art

Satellite broadcasting has become very popular throughout the United States. Conventionally, broadcast signals are transmitted through an artificial satellite at very high frequencies. These frequencies are generally amplified and are processed by a particular device after received by an antenna or antennas and prior to application to a conventional home television set or the like.

Typically, broadcasting systems comprises an outdoor unit, generally associated with the antenna, and an indoor unit, generally associated with the television set, or the

EXHIBIT B

like. Both units, indoor and outdoor, are coupled via a coaxial cable.

A problem associated with these types of systems is that they are designed to accept signals through a line of sight. Accordingly, if the satellite is not visual from a building, then the signal cannot be transmitted. Thus, these systems are rendered useless for high-rises, hospitals, schools, and the like. These systems are limited in usage, and, as such, can only be utilized in residential homes.

As an example, US Patent No. 5,301,352, issued to Nakagawa et al. discloses a satellite broadcast receiving system. The system of Nakagawa et al. includes a plurality of antennas which, respectively, include a plurality of output terminals. A change-over divider is connected to the plurality of antennas and includes a plurality of output terminals. A plurality of receivers are attached to the change-over divider for selecting one of the antennas. Though this system does achieve one of its objects by providing for a simplified satellite system, it does, however, suffer a major short-coming~~s~~ by not providing a means of receiving satellite broadcasting for individuals who are not in the direct line of sight to the antennas. This system is silent to the means of simultaneously

transmitting vertical and horizontal polarized signals via a single coaxial cable.

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9/25/97

US Patent No. 5,206,954, issued to Inoue et al. and US Patent No. 4,509,198 issued to Nagatomi both disclose yet another satellite system that includes an outdoor unit that is connected to a channel selector. In this embodiment, the satellite signal receiving apparatus receives vertically and horizontally polarized radiation signals at the side of a receiving antenna. The signals are then transmitted, selectively, to provide for either one of the vertically or horizontally polarized signals to be transferred. Hence, utilizing a switch~~,~~ allow for only one polarity ~~is~~ to be transmitted. This design and configuration provides for one coaxial cable to be utilized, but does not provide for the vertical and horizontal signals to be transmitted simultaneously~~, but rather,~~ This system selectively.

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Systems have been attempted for transferring two frequencies on the same co-axial cable. Frequencies of the same polarity can easily be transmitted via a single co-axial cable, however, transmitting two signals, from two sources, each of different polarities can be a challenge. In some satellite configuration systems, once a timing diagram is plotted for the signals to be transmitted, it is seen that a forbidden path occurs between frequencies of 950 MHz and 1070 MHz. Inherently prohibiting the frequencies within

that range to be transmitted successfully. Hence, it is desirable to obtain a system which will not allow for conversion to occur at frequencies of the forbidden conversion.

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As seen in German Patent Number DE4126774-A1, signals can be fail ~~transmitted~~ within the range of the forbidden path, thereby, providing for a non-working system. Additionally, this product, like the assembly disclosed in Japanese Application No. 63-293399 both disclose a system which receives a single signal and demultiplexed them into vertical and horizontal polarized signals. These systems, are complex and require a numerous amount of components in order to employ the invention. This increase in components will inherently cause an increase in component failure. Further, these systems fail to disclose a means of reconverting the signals into their original frequency and polarity, a necessity for satellite systems. Consequently, the system provides ~~providing~~ a signal which will not maintain its respective polarity.

Accordingly, it is seen that none of these previous efforts provide the benefits intended with the present invention, such as providing a broadcasting receiving and distribution system that will allow for the transmission of vertical and horizontal or left-hand circular and right-hand circular polarization signals to be transmitted successfully

and simultaneously via a single coaxial cable. Additionally, prior techniques do not suggest the present inventive combination of component elements as disclosed and claimed herein. The present invention achieves its intended purposes, objectives and advantages over the prior art device through a new, useful and unobvious combination of component elements, which is simple to use, with the utilization of a minimum number of functioning parts, at a reasonable cost to manufacture, assemble, test and by employing only readily available material.

SUMMARY OF THE INVENTION

The present invention provides a satellite broadcast receiving and distribution system that will permit for the transmission of vertical and horizontal or left-hand circular and right-hand circular polarization signals simultaneously via a single coaxial cable. The system of the present invention will accommodate two different polarity commands from two or more different sources at the same time. This satellite broadcast receiving and distribution system of the present invention will provide for the signals received from the satellite to be converted to standard frequencies so as to permit for signals to travel via existing wiring which the present day amplifiers can transport in buildings, high-rises, hospitals, and the like, so that satellite broadcasting can be viewed by numerous individuals by way of a single satellite antenna.

The satellite broadcast system of the present invention comprises a satellite antenna which receives the polarized signals, a head-in frequency processor for converting the polarized signals, a single co-axial cable for transmitting the converted signal, a head-out receiver processor for re-converting the signals to their original frequency and polarity, and a source, which receives the signals in their respective original frequency and polarity. Structurally, the head-in frequency processor is coupled to the head-out

receiver processor via the single co-axial cable. The source is coupled to the head-out receiver processor.

Hence, to allow for successful conversion, the head-in processor converts the received signals of two different polarities to frequencies which permit for transmission simultaneously. The head-in processor will also accommodate two different polarity commands from two or more different sources at the same time via the single cable.

The single cable couples the head-in processor to the head-out processor. Once in the head-out processor, the signals are re-converted to their original state for transmission to the source (i.e. television).

Accordingly, it is the object of the present invention to provide for a satellite broadcast receiving and distribution system which will overcome the deficiencies, shortcomings, and drawbacks of prior satellite broadcast systems and signals and polarity transfer methods.

It is another object of the present invention to provide for a satellite broadcast receiving and distribution system that will convert different frequencies and different polarized signals in order to permit the signals to be transmitted via a single coaxial cable.

Another object of the present invention is to provide for a satellite broadcast receiving and distribution system that will provide service to mid/high-rise office buildings,

condominiums, schools, hospitals and the like via a single satellite.

Still another object of the present invention, to be specifically enumerated herein, is to provide a satellite broadcast receiving and distribution system in accordance with the preceding objects and which will conform to conventional forms of manufacture, be of simple construction and easy to use so as to provide a system that would be economically feasible, long lasting and relatively trouble free in operation.

Although there have been many inventions related to satellite broadcast receiving and distribution systems, none of the inventions have become sufficiently compact, low cost, and reliable enough to become commonly used. The present invention meets the requirements of the simplified design, compact size, low initial cost, low operating cost, ease of installation and maintainability, and minimal amount of training to successfully employ the invention.

The foregoing has outlined some of the more pertinent objects of the invention. These objects should be construed to be merely illustrative of some of the more prominent features and application of the intended invention. Many other beneficial results can be obtained by applying the disclosed invention in a different manner or modifying the invention within the scope of the disclosure. Accordingly,

a fuller understanding of the invention may be had by referring to the detailed description of the preferred embodiments in addition to the scope of the invention defined by the claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram illustrating the components used for the satellite broadcast receiving and distribution system according to the present invention.

Figure 2 is a block diagram representing a first embodiment of the head-in frequency processor and two embodiments of the head-out frequency processor used for the satellite broadcast receiving and distribution system according to the present invention.

Figure 3a is a schematic diagram of the down converter used for the satellite broadcast signal receiving and distribution system according to the present invention.

Figure 3b is a schematic diagram of the up converter used for the satellite broadcast signal receiving and distribution system according to the present invention.

Figure 4 is a block diagram of the second embodiment of the satellite broadcast signal receiving and distribution system according to the present invention.

Figure 5 is a block diagram of the third embodiment of the satellite broadcast signal receiving and distribution system according to the present invention.

Similar reference numerals refer to similar parts throughout the several views of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in **figure 1**, the satellite system **10** of the present invention includes a receiving satellite **12** that will transmit signals (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals) to a head-in equipment frequency processor **14**. It is at this head-in equipment frequency processor **14** where the signals are received simultaneously and then transmitted via a single coaxial cable **16** to the head-out receiver processor **18**. This will enable for the single coaxial cable **16** to transmit signals of two different polarities and frequencies simultaneously. From the head-out frequency processor the signals are reconverted to its original state and then transmitted to a source 20. As seen in figure 1, the two different polarities (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals) are transported to the source via separate cables **22a** and **22b**, respectively.

The system of the present invention includes separate embodiments, and the first embodiment is illustrated in figure 2. As seen in the first embodiment of the present invention **10a**, there is shown a head-in frequency processor **14a** couple to either a first head-out frequency processor **18a** or a second head-out frequency processor **18b**.

It is noted that figure 2 illustrate~~d~~s the head-in processor **14a** to be coupled to two separate head-out processors **18a** and **18b**, respectively. This is shown for illustrative purposes only. In actuality, only one head-out receiver processor is utilized with the head-in processor **14a**. The type and embodiment used for the head-out receiver processor is dependent to the combination of the satellite receiver and source that is utilized.

As seen in **figure 2**, the head-in equipment frequency processor **14a** will receive two signals or two separate polarities and convert~~ed~~ them to separate frequencies for enabling transmission via a single coaxial cable 16a ~~**16b**~~.

A low-noise block converter (LNB) **24** will receive the signals from the satellite **12**. This LNB **24** is conventional and is used for amplifying the respective polarized signals (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals). Accordingly, after signals are received, they pass the low-noise block converter **24**, to provide for the signals to enter the head-in equipment frequency processor **14a** (illustrated in figure 2 as dashed lines) via conduits **26a** and **26b**, respectively.

The head-in equipment frequency processor **14a**, illustrated in **figure 2**, provides for the signals to be converted, via converters **28** and **30**, to the frequencies

which the present day amplifiers can transport. In this stage of the system, the object is to convert the signals of one polarity up (via converter 30) and to convert the signals of second polarity ~~polarization~~ down (via converter 28). This will render the converted signals to be transmitted without emerging into the forbidden frequency conversion.

From the conduits 26a and 26b, the signals are transmitted to a first converter or down converter 28 and a second converter or up converter 30. These frequency converters, 28 and 30, respectively, convert the entered frequencies to a frequency which present day amplifies can transport. The converters will be discussed in further detail in figures 3a and 3b. The utilization of two converters permit for the acceptance of two signals or polarized transponders that are of a different frequency.

In the down converting means 28, the transponder is converted down to a specified frequency. The specified frequency is the frequency that is required for the present day amplifiers for transportation. The newly converted frequencies are amplified through the amplifying means 32a. At means 32a ~~32~~, the converted frequencies are amplified so not to create second harmonics. These signals are then transferred to a conventional four way splitter 34a.

In the up converting means 30, the transponders are converted up to a specified frequency. The converted

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frequencies then are converted down via a down converter **36**. This process of converting up and then down provides for frequencies to be converted without difficulties and avoiding the forbidden conversion area.

The converted signals are transferred to the four way splitter **34**a in order to combine the frequency of the amplified signal of **32a** and frequency from converter **36**. To synchronized the system, the frequencies from the phase lock loop (PLL) transmitter **38a** are transmitted to the splitter **34a**.

From the splitter **34a**, the signals are passed through an AC power separator **40** which routes 60 Volts power to a DC power supply of **18** Volts. This will permit for the dual frequencies from the satellite dish **12** to be transmitted simultaneously via a single coaxial cable ~~16b~~ 16a. Dependent upon the length of the cable, an optional conventional amplifier **42** can be coupled thereto. Power from a power source **44** is inserted into the lines via a power inserter **46**. The signals are amplified, as ~~need~~ needed, with additional amplifiers **48**. It is noted that the amplifiers are optional and are dependent to the distance that the head-in frequency processor **14a** is located from the head-out frequency processor **18a** or **18b**. The power supply and power source **11** energizes the head-in frequency processor **14a**.

From the single coaxial cable 16a ~~**16b**~~, the signals are adjusted via a tap 50a to permit for the appropriate decibels that are required for the head-out processor **18a** or **18b**.

The head-out frequency processor used for the head-in processor **14a** illustrated in figure 1, can include two embodiments, dependent upon the embodiment for the source in combination with the satellite receiver.

The first embodiment for the head-out frequency processor is illustrated in **figure 2** by way of dash line **18a**. As seen in this embodiment, the simultaneously transmitted signals enter the processor via conduit **16b**. The conduit **16b** is coupled to a conventional four (4) way splitter **34b**. A conventional phase lock loop (PLL) receiver 56a is coupled to the splitter 34b ~~**34a**~~ to permit for the signals to be locked to the proper and desired frequencies. From the splitter **34b** the first frequency is transmitted to a first converter **58a** in order to permit for the signals or transponders to be converted up to a specified frequency. This up converted signal from the first converter or up converter **58a** is then transmitted to the satellite receiver by way of a conduit **22b**.

The second frequencies are transmitted to a first or up converter **52a** and then are transported ~~transmuted~~ to a second or down converter **54a**. This will permit for the signals to be

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converted to the desired frequency. This second or down converter is coupled to the satellite receiver **21** via conduit **22a**. The signals from down converter **54a** and from up converter **58a** are in the original state, both frequency and polarity, when transmitted from the satellite to the head-in processor **14a**, via lines **26a** and **26b**. The re-converted signals, frequencies and polarity in its original state, ~~is~~ are transmitted to the satellite receiver **21** via lines **22a** and **22b**. The satellite receiver **21** is coupled to a source **20** (illustrated as a television) to provide for proper transmission of the signals. The transmission line between the satellite receiver **21** and source **20** is illustrated but not labeled.

Hence, it is seen that the head-in processor converted the signals to different ~~frequency~~ frequencies to enable the transmission of two separate polarized signals via a single co-axial cable to a head-out processor. From the head-out processor, the signals are re-converted to their original state, which was received via lines **26a** and **26b**. For example, with satellite systems, frequencies typically range between 950 - 1450 MHz. If the satellite transmits a frequency of 1450 for both the horizontal and vertical polarities, then one of the polarities, such as horizontal, is converted down to 560 MHz via converter **28**. The second frequency of the second polarity, such as vertical, is first

converted up to 2010 and then back down to 1070, via converters **30** and **36**, respectively. Such a conversion allows for the two frequencies of two different polarities, 560 MHz (horizontal) and 1070 MHz (vertical), to be transmitted simultaneously on a single co-axial cable (16a and 16b ~~**16b**~~).

As illustrated, this head-out frequency processor is the reverse process of the head-in processor. This is to provide for the signals to reconverted to its original frequencies so as to provide for the satellite receiver **21** and source **20** to accept the signals. The single cable **16b** accepts the signals at frequencies different than that of the source. Accordingly, the head-out processor must re-convert the signals to the frequencies that are utilized by the source **20**.

An alteration of the satellite receiver requires an alteration in the head-out receiver processor. This alteration is illustrated in **figure 2** and is shown in outline designated as reference **18b**. In this design and configuration, the satellite receiver utilizes only one wire and accepts only one type of signal~~s~~, selectively, such as only left-hand circular or only right hand circular polarized signals.

As seen, the frequencies are tapped via **50b**. The tap **50b** is coupled to the head-out processor **18b** via line **16b** which is connected to a four (4) way splitter **34c**. To

provide for the signals to be locked in proper frequencies, the four way splitter is coupled to a phase lock loop (PLL) receiver **56b**.

From the splitter **34c**, the first signal of a first polarity is transmitted to a first or up converted **52b** and then is transmitted to a second or down converter **54b**. The conversion of the signals from up to down provides the benefit of converting the frequency without any mishap or error. This method of conversion will avoid the forbidden conversion area as well as provide for the original received frequency and polarity of the signals.

The signals of the second frequency and second polarity are transmitted to an up converter **58b** which will inherently convert the signals to its original received frequency while maintaining its polarity. A polarity switch **60** is connected to converters **52b**, **54b**, and **58b** for coupling the head-out processor to the satellite receiver via a single cable **22c** and a joining means, which is a four way splitter **34d**. The satellite receiver **21** is connected by way of a line (illustrated, but not labeled) to a source **20**. In this embodiment, the switch **60** is used to determine which polarity will enter into the head-out processor **18b**.

In the embodiments shown above, the satellite receiver **21** and source **20** are conventional components and as such, their schematics are not shown in further detail. The up

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and down converters used in the embodiment above will be discussed in further detail in **figures 3a** and **figure 3b**. **Figure 3a** represents the schematic rendering of the down converters (**28**, **36**, **54a**, and **54b**) and **figure 3b** represents the schematic rendering of the up converters (**30**, **52a**, **52b**, **58a**, and **56b**).

As seen in the schematic diagram of **figure 3a**, the signal enters the down converter via line **L1**. The entered signal passes through a first capacitor **C1** which is coupled to an amplifier **AMP**. After passing the amplifier **AMP**, the signal passes a second capacitor **C2** before entering a first low pass filter **LPF1**. This first **LPF1** is coupled to a mixer which is coupled to a second **LPF2**. This second **LPF2** is connected to a third capacitor **C3** which is coupled to a second choke **CH2**. The mixer is also connected to an oscillator **OSC**. The oscillator is coupled to a PPL ~~PLL~~. The first capacitor **C1** is also connect to a first choke CH1 ~~CH2~~. Capacitors C, C1, C2, C3 ~~C~~ are coupled to the amplifier, oscillator, phase lock lope **PPL**, and the second low pass filter. Resistors **R** are coupled to the amplifier, oscillator, first low pass filter and mixer. Chokes are also coupled in series with capacitors ~~C~~ to provide for the chokes to be parallel with the amplifier **AMP** and the second low pass filter, respectively. As seen the chokes **CH1** and **CH2** (inductors)

and capacitors C are a DC bypass filter network and provide a DC path and enables passing DC power to the antenna electronics.

The up converter is disclosed in **figure 3b**. As seen in this drawings, the signal enters the up converter via a first line **L2**. The converter further includes an amplifier AMP ~~AMP~~ that is coupled to a first low pass filter **LP1**. The amplifier is also coupled to an oscillator **OSC**. The oscillator and the first low pass filter are connect to a mixer. This mixer is coupled to a high pass filter **HPF**. The oscillator is also connected with a phase lock loop receiver **PLL**. A second amplifier **AMP2** is coupled to the high pass filter **HPF**. A second low pass filter **LPF2** is coupled to the second amplifier. Capacitors C are coupled to the first amplifier, first lower pass filter, and a the amplifier. Resistors R are coupled other first and second amplifiers, oscillator, first low pass filter, and mixer. Chokes are also used in this circuit. The first choke is coupled to a capacitor which is coupled to the first amplifier. The second chock is coupled to the phase lock loop.

Simplifying the headout processor ~~system~~ described above, will provide another ~~a second~~ embodiment for the satellite broadcast receiving and distribution system. This ~~second~~ system is illustrated in further detail in **figure 4**. This embodiment simplifies the

above describe embodiments and also provides a device which avoids the forbidden path. Alteration for this embodiment occurs in the head-in equipment frequency processor **14b** and the head-out frequency processor **18c**.

As with the first embodiment, a low-noise block converter (LNB) **24** will receive the signals from the satellite **12**. This LNB **24**, as stated previously, is conventional and is used for amplifying the respective polarized signals (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals). Hence, after signals are received, they pass the low-noise block converter **24**, to provide for the signals to enter the head-in equipment frequency processor **14b** (illustrated in figure 4 as dashed lines) via conduits **26a** and **26b**, respectively.

The head-in equipment frequency processor ~~**14a**,~~ 14b provides for the signals to be converted, via converters **28** and **30**, as identified for the first embodiment. Thereby providing a system which includes frequencies that the present day amplifiers can transport. In this stage of the system, the object is to convert the signals of one polarity up (via converter **30**) and to convert the signals of second polarization down (via converter **28**).

From the conduits **26a** and **26b**, the signals are transmitted to a first converter or down converter **28** and a

second converter or up converter **30**. These frequency converters, **28** and **30**, respectively, convert the entered frequencies to a frequency which present day amplifies can transport. The converters have been discussed in further detail in figures 3a and 3b. The utilization of two converters permit for the acceptance of two signals or polarized transponders that are of a different frequency.

In the down converting means **28**, the transponder is converted down to a specified frequency. The specified frequency is the frequency that is required for the present day amplifiers for transportation. Though not illustrated, the newly converted frequencies are amplified through the amplifying means, as illustrated in **figure 2** via element **32a**. At the amplifying means **32**, the converted frequencies are amplified so not to create second harmonics. These signals are then transferred to a conventional two-way splitter **34c**.

In the up converting means 30, the transponders are converted up to a specified frequency. The converted signals are transferred to the two-way splitter **34c** in order to combine the frequency of the amplified signals ~~and frequency~~. To synchronized the system, the frequencies from the phase lock loop (PLL) transmitter **38a** are transmitted to the splitter **34c**.

From the splitter **34c**, the signals are passed through a conventional tilt and gain **62**. This will permit for the dual frequencies from the satellite dish **12** to be transmitted simultaneously via a single coaxial cable 16a ~~**16b**~~. Dependent upon the length of the cable, an optional conventional amplifier **42** can be coupled thereto. Power from a power source **44** is inserted into the lines via a power inserter **46**. The signals are amplified, as needed, with additional amplifiers **48**. It is noted that the amplifiers are optional and are dependent to the distance that the head-in frequency processor **14b** is located from the head-out frequency processor **18c**. The power supply and power source **11** energize the head-in frequency processor 14b ~~**14a**~~.

From the single coaxial cable 16a ~~**16b**~~, the signals are adjusted via a tap **50a** to permit for the appropriate decibels that are required for the head-out processor 18c ~~**18a or 18b**~~.

The head-out frequency processor used for the head-in processor **14b** is illustrated in by way of dash line **18c**. As seen in this embodiment, the simultaneously transmitted signals enter the processor via conduit **16b**. The conduit **16b** is coupled to a conventional two (2) way splitter **34d**. A conventional phase lock loop (PLL) receiver **56a** is coupled to the splitter **34d** to permit for the signals to be locked

to the proper and desired frequencies. From the splitter **34d** the first frequency is transmitted to a first converter **52c** in order to permit for the signals or transponders to be converted up to a specified frequency. The ~~This up~~ converted signals from the first converter or up converter **52c** are ~~is~~ then transmitted to the satellite receiver by way of a conduit **22a**.

The second frequencies are transmitted to a down converter **54c**. This will permit for the signals to be converted to the desired frequency. This second or down converter is coupled to the satellite receiver **21** via conduit **22b**. The signals from down converter **54c** and from up converter **52c** are in the original state, both frequency and polarity, when transmitted from the satellite to the head-in processor **14b**, via lines **26a** and **26b**. The re-converted signals, frequencies and polarity in its original state, are ~~is~~ transmitted to the satellite receiver **21** via lines **22a** and **22b**. The satellite receiver **21** is coupled to a source **20** (illustrated as a television) to provide for proper transmission of the signals. The transmission line between the satellite receiver **21** and source **20** is illustrated but not labeled.

Hence, it is seen that the head-in processor converted the signals to different frequencies ~~frequency~~ to enable the transmission of two separate polarized signals via a single

co-axial cable to a head-out processor. From the head-out processor, the signals are re-converted to their original state, which was received via lines **26a** and **26b**. The above identified embodiment is ideal for long distant use, i.e. exceeding 1000 feet. However, for shorter distance, i.e. less than 1000 feet, the components can be simplified again to provide for a device which is ideal for use in apartments or the like.

As seen in figure 5, the present invention includes the head-in equipment frequency processor **14c** and the head-out frequency processor **18d**.

As with the ~~first and second~~ previous embodiments, a low-noise block converter (LNB) **24** will receive the signals from the satellite **12**. This LNB **24**, as stated previously, is conventional and is used for amplifying the respective polarized signals (Vertical-polarized signals and Horizontal-polarized signals or left-hand circular and right-hand circular polarization signals). Hence, after signals are received, they pass the low-noise block converter **24**, to provide for the signals to enter the head-in equipment frequency processor **14c** (illustrated in figure 5 as dashed lines) via conduits **26a** and **26b**, respectively.

As seen, this head-in equipment frequency processor **14c** is simplified. The head-in equipment frequency processor **14c**, provides for signals of one frequency to be converted,

up via converter 30, as identified for the first embodiment. Thereby providing a system which includes frequencies that the present day amplifiers can transport. In this stage of the system, the object is to convert the signals of one polarity up (via converter ~~38~~ 30). The signal of the second polarity is amplified via conventional amplifier **32a**.

From the conduits **26a** and **26b**, the signals are transmitted to a first converter or ~~down~~ up converter ~~52d~~ 30 and a amplifier **32a**. The down converters have been discussed in further detail in figure 3a.

From the amplifier and up converter, the signals are transferred to a conventional hybrid mixer ~~34a~~ 36. From the mixer, the signals pass a ~~diplexer~~ deplexer 64. ~~Exiting~~ Signals exit the diplexer ~~can occur~~ via a single co-axial cable **16a**.

From the single coaxial cable **16a**, the signals can be adjusted via a tap (illustrated, but not labeled) to permit for the appropriate decibels that are required for the head-out processor **18d**.

The head-out frequency processor used for the head-in processor **14c** is illustrated in by way of dash line **18d**. As seen in this embodiment, the simultaneously transmitted signals enter the processor via conduit **16b**. The conduit **16b** is coupled to a conventional mixer **36b**. ~~to the proper and desired frequencies.~~ From the mixer **36b** the first frequency is transmitted to an amplifier **32b** and the second

frequency of a different polarity is transferred to a down converter **52d** for converting the frequency to its original state.

The re-converted signals, frequencies and polarity in its original state, is transmitted to the satellite receiver **21** via lines **22a** and **22b**. The satellite receiver **21** is coupled to a source **20** (illustrated as a television) to provide for proper transmission of the signals. The transmission line between the satellite receiver **21** and source **20** is illustrated but not labeled.

Hence, it is seen that the head-in processor converted the signals to different frequency to enable the transmission of two separate polarized signals via a single co-axial cable to a head-out processor. From the head-out processor, the signals are re-converted to their original state, which was received via lines **26a** and **26b**. The above

The satellite system of the present invention will permit for two signals of different frequency and polarities to travel simultaneously via a single coaxial cable. The use of this will provide for a satellite system that is versatile, economical and compact. The usage of the single cable permits for a system that can accept satellite broadcasting in places that were previously render impossible. These places include mid/high-rise office buildings, condominiums, hospitals, schools, etc. The

unique design and configuration enables the signals to be transmitted via the existing wiring of the buildings. The only renovations that may need to be done is the upgrading of the existing amplifiers.

While the invention has been particularly shown and described with reference to an embodiment thereof, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention.

We claim:

1. A satellite broadcasting system comprising:

a satellite dish coupled to a low-noise block converter;

said low-noise block converter is coupled to a first means of converting vertical polarization signals and horizontal polarization signals or left-hand circular polarization signals and right-hand circular polarization signals from a satellite and transmitting simultaneously via a single coaxial cable for enabling two different frequencies and polarities to be transmitted simultaneously via said single coaxial cable;

a second means is coupled to said first means;

said second means converts said vertical polarization signals and said horizontal polarization signals or said left-hand circular polarization signals and said right-hand circular polarization signals from said first means to its original received ~~state~~ frequency and polarity from said satellite dish;

a satellite receiver is coupled to said second means; and

~~said~~ a source is coupled to said satellite receiver.

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2. A satellite system as in claim 1 wherein a power source is could to said first means and said power source powers said first means.

3. A satellite system as in claim 1 wherein said second means provides for said signals to be converted separately and independently to said satellite receiver by a transmitting means.

4. A satellite system as in claim 1 wherein said second means provides for a transmitting means for said signals to be selectively converted to said satellite receiver via a first cable coupled to said second means.

5. A satellite system as in claim 4 wherein said transmitting means further includes a polarity switch for permitting said signals to be selectively converted to said satellite receiver.

6. A satellite system as in claim 1 wherein said first means includes a first converting system for converting said signals of a first direction to a desired first frequency and polarization and a second converting system for converting said signals of a second direction to a desired second frequency and polarization.

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Abstract of the Disclosure

The present invention provides a satellite broadcast receiving and distribution system that will permit for the transmission of vertical and horizontal or left-hand circular and right-hand circular polarization signals simultaneously via a single coaxial cable. The system of the present invention will accommodate two different polarity commands from two or more different sources at the same time. This satellite broadcast receiving and distribution system of the present invention will provide for the signals received from the satellite to be converted to standard frequencies so as to permit for signals to travel via existing wiring which the present day amplifiers can transport in buildings, high-rises, hospitals, and the like so that satellite broadcasting can be viewed by numerous individuals by way of a single satellite antenna.

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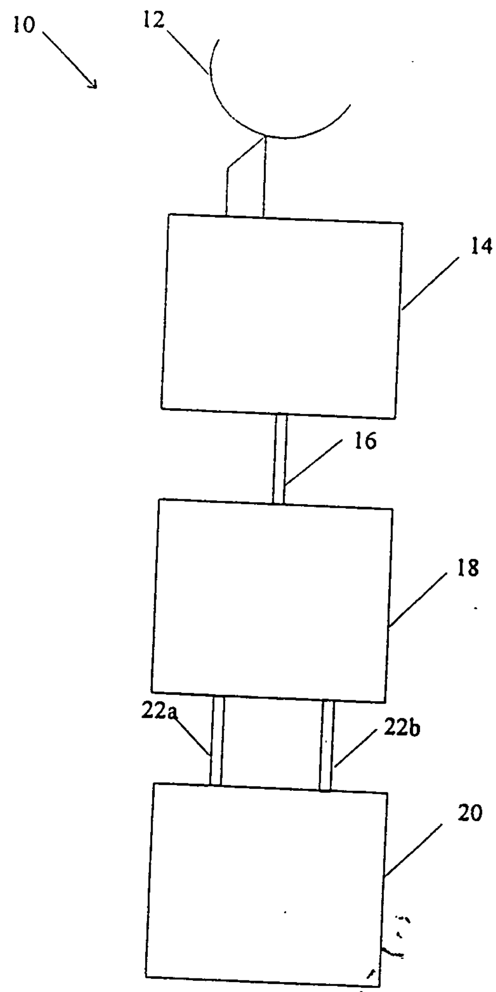

Figure 1

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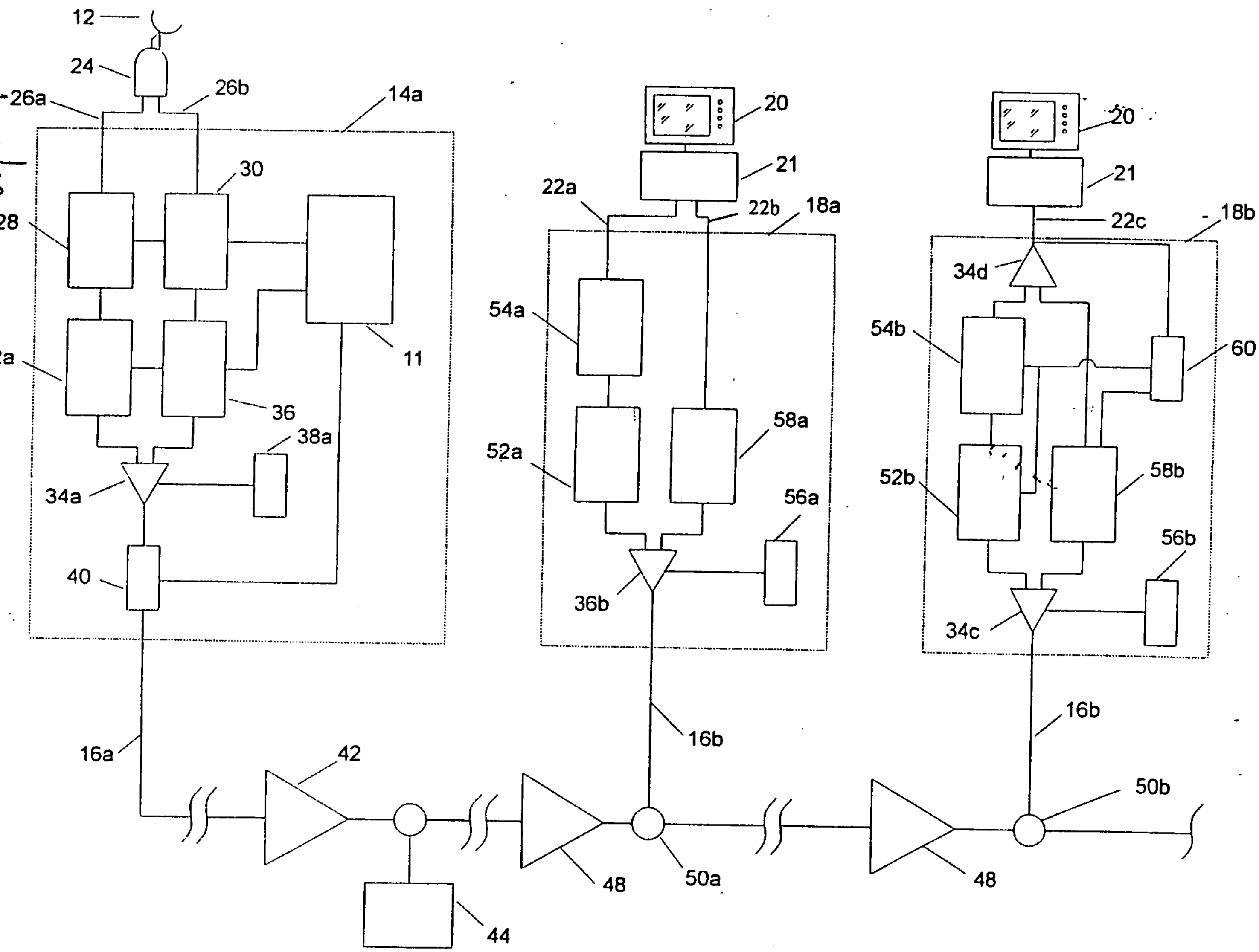

Figure 2

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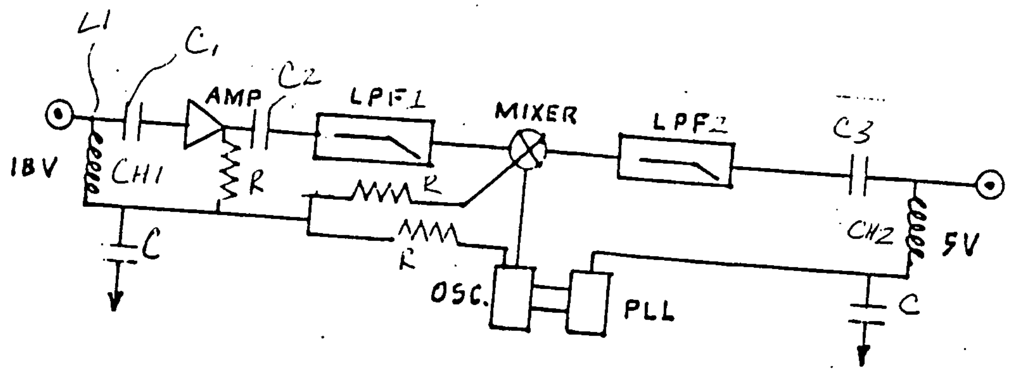

Fig. 3a

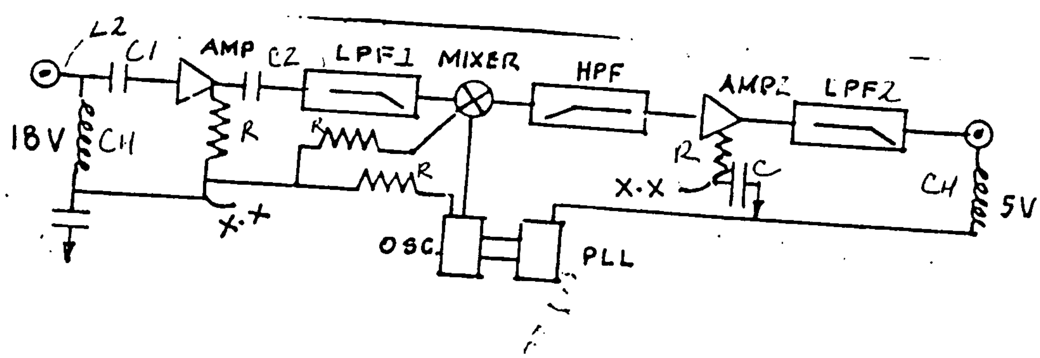

Fig. 3b

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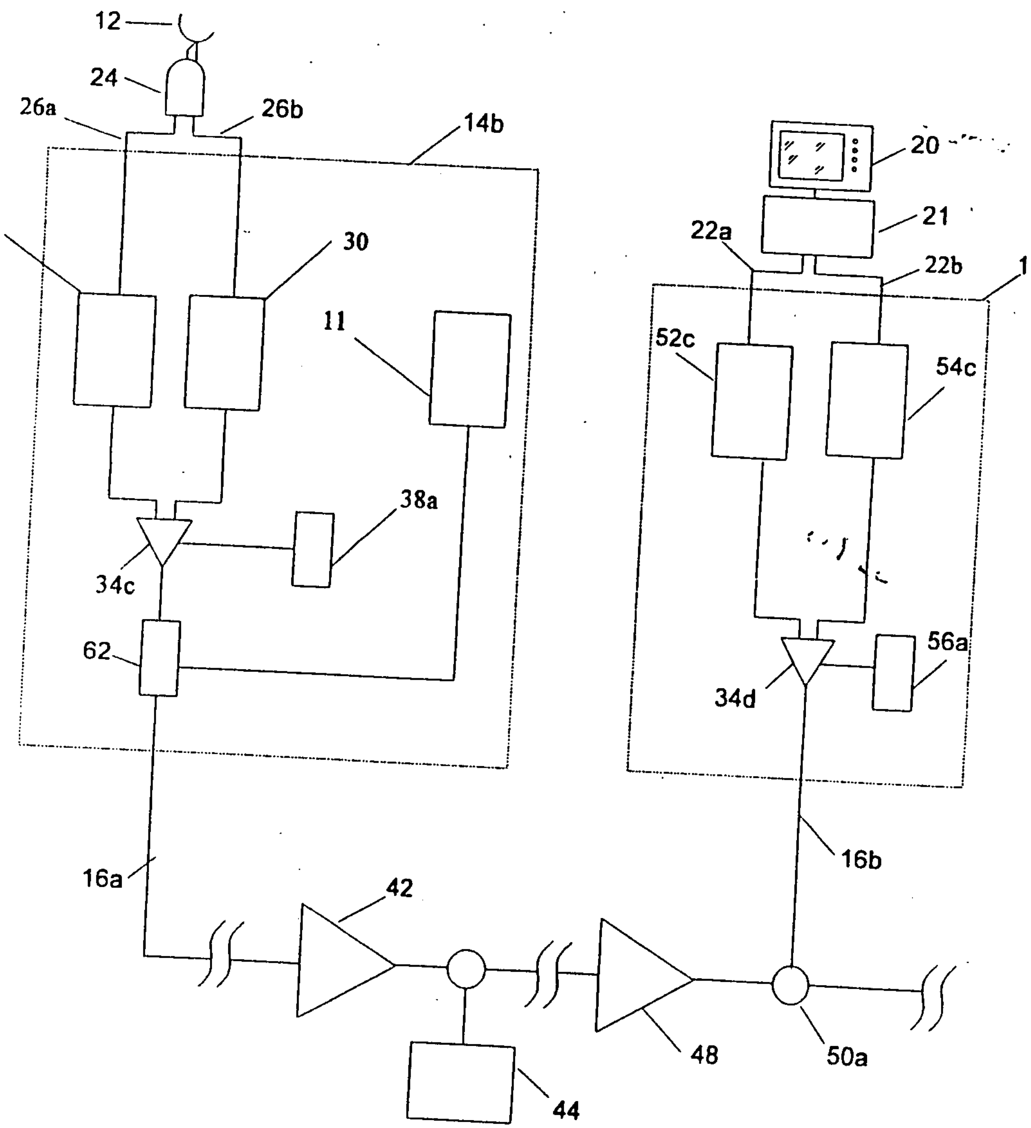

Figure 4

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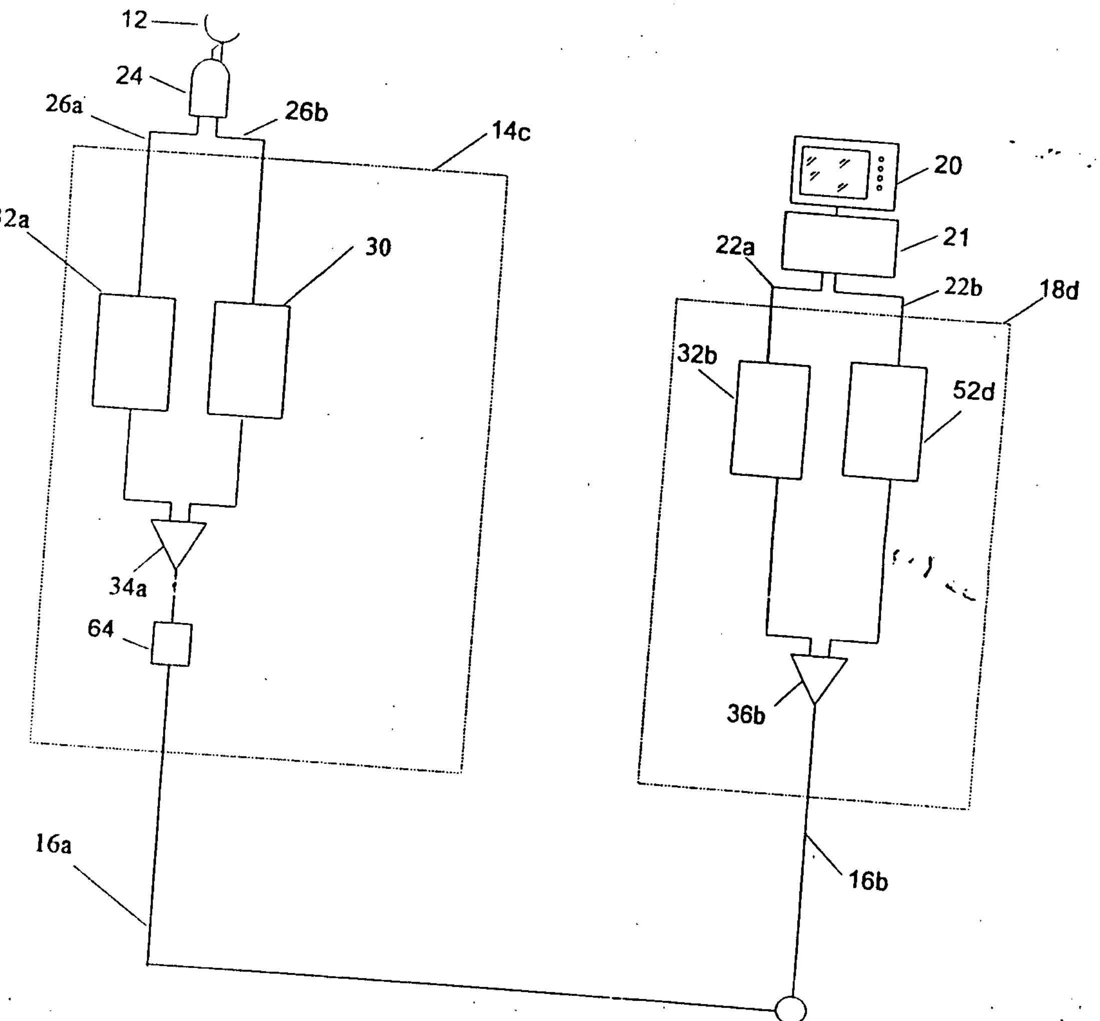

Figure 5

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